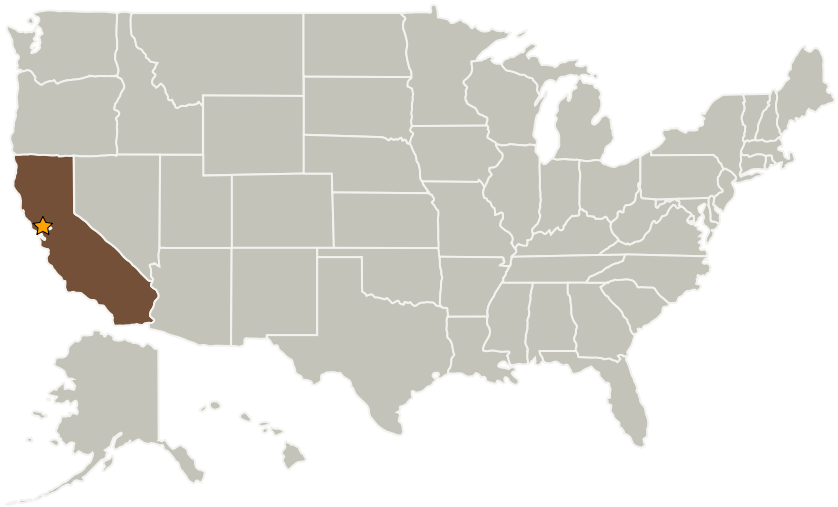
Lightweight Hybrid Ablator Incorporating Aerogel-Filled Open-Cell Foam Structural Insulator, Phase I

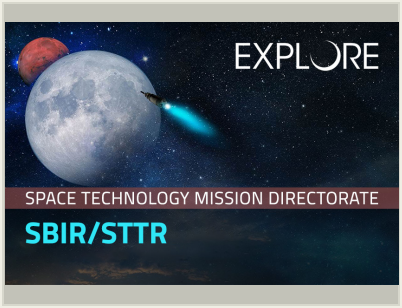
Completed Technology Project (2009 - 2009)

Project Introduction

In previous work for NASA and DoD, Ultramet developed lightweight open-cell foam insulators composed of a carbon or ceramic structural foam skeleton filled with a high temperature nanoscale aerogel insulator. The structural integrity and high insulation behavior have been demonstrated when used in combination with a non-ablating, coated carbon/carbon or ceramic matrix composite outer shell. The potential exists to develop a hybrid ablator/insulator thermal protection system in which a portion of the thickness of a low conductivity, structural foam aeroshell is infiltrated with an ablative material (frontface) and the remaining thickness is filled with the high temperature aerogel insulator (backface). The potential benefit is a reduction in ablator mass required to reject the aerothermal heat load. The vehicle interface temperature will be controlled by the aerogel-filled portion of the foam structure, rather than by ablator thickness, thereby allowing the use of less ablator material. The reduced volume needed will allow use of a conventional high density, high heat flux capability ablator, offering greater mission flexibility. In this project, Ultramet will team with Materials Research & Design for preliminary thermomechanical design work and will construct a ceramic foam-reinforced hybrid ablator/insulator. Preliminary performance will be established through hot-gas testing.

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Ames Research Center (ARC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Ames Research Center(ARC)	Lead Organization	NASA Center	Moffett Field, California
Ultramet	Supporting Organization	Industry	Pacoima, California

Primary U.S. Work Locations
California

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.2 Thermal Control Components and Systems
    - TX14.2.4 Insulation and Interfaces